



Potential Impacts on Air Quality of the Use of Ethanol as an Alternative Fuel

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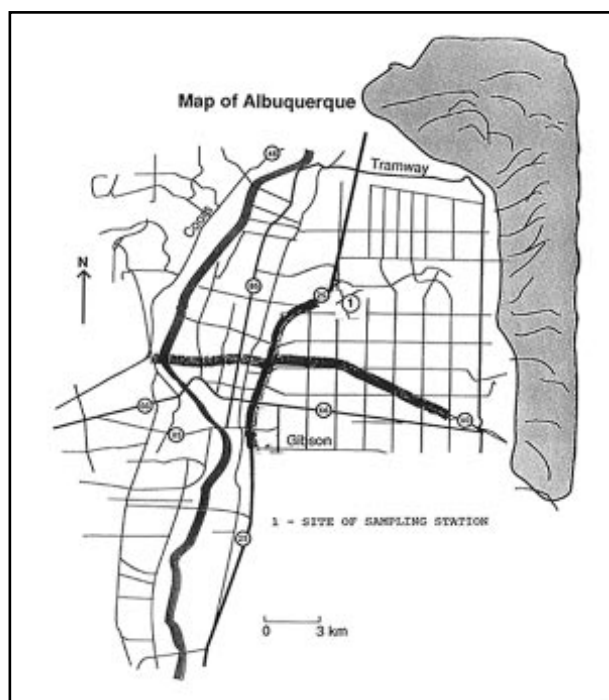
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Objective

To focus on the potential effects of alcohol fuels on air quality in urban and regional areas, primarily to obtain a data set for examining the possible impacts of ethanol (EtOH)/gasoline blends by taking measurements in Albuquerque, New Mexico when these fuels are used.

Approach

This study conducts field tests to evaluate the potential air quality impacts of using EtOH/gasoline blends to fuel motor vehicles. Researchers took ambient air measurements at a centrally located site in Albuquerque during the summer of 1993 and the winter of 1994 for



Map of Albuquerque

comparative analysis. In New Mexico, the use of 10% alcohol blends has been mandated (more than 99% use) during the winter, and use during the summer is substantially less (less than 5% statewide).

In collaboration with New Mexico Tech and the City of Albuquerque Environmental Health Department Air Pollution Control Division, researchers measured wind speed, wind direction, ozone (O_3), nitric oxide (NO), oxides of nitrogen (NO_x), carbon monoxide (CO), peroxyacetyl nitrate (PAN), aldehydes, organic acids, daytime temperature, and ultraviolet-B (UV-B) radiation by using a wide array of analytical instrumentation. The results of these measurements are being analyzed with regard to the potential primary emissions of acetaldehyde from EtOH in the fuel mixture.

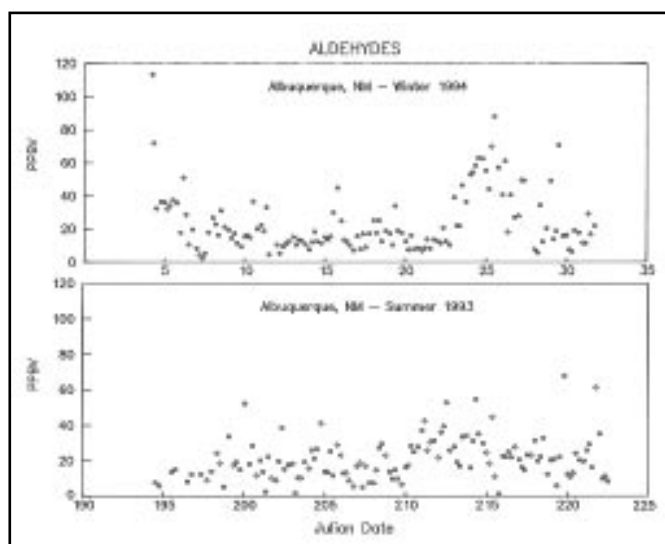
The potential for using CO isotopic analysis to determine the relative roles of various hydrocarbon (HC) sources (natural versus anthropogenic) is being examined using infrared (IR) and other spectroscopies to better estimate the relative impacts of EtOH fuel on urban air quality.

Accomplishments

Argonne has completed two field studies in Albuquerque and has shown that the use of EtOH may affect aldehyde and PAN levels during the winter. The data obtained to date indicate that the natural organic emissions during the summer may play an important role in the urban atmospheric chemistry.

Future Direction

This project will collect more urban winter data for comparison with rural data for modeling. Laboratory techniques are being developed to measure CO isotopic signals that will be able to directly evaluate the relative impacts of fossil, EtOH, and natural HC sources on air chemistry and quality.



Publications

Popp, C.J., L. Zhang, and J.S. Gaffney. 1994. "Organic Carbonyl Compounds in Albuquerque, New Mexico, Air. A Preliminary Study of the Effects of Oxygenated Fuel Use." *Alternative Fuels and the Environment*, Francis Sterret, ed., Chapter 4, pp. 61-74.

Popp, C.J., M.J. Hind, L.G. Reyes, J.S. Gaffney, and N.A. Marley. 1994. "Atmospheric Concentrations of Low Molecular Weight Aldehydes and Carboxylic Acids at Urban and Rural Sites in Central New Mexico." *Proceedings of the Symposium on Atmospheric Organic Chemistry*, ACS Books, Lewis Publishers, in press.